

Neonatal Proximal Humerus Osteomyelitis: A Case Report and Literature Review

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Abstract

Objective – This case report was written with the purpose of educating neonatal caregivers with regard to the early detection of osteomyelitis in order to start treatment quickly and avoid the devastating consequences later with lifelong disability. **Case Report** – We present a 20-day-old newborn with a lack of spontaneous movement of the right arm, which first occurred 5 days prior. The newborn was diagnosed with Erb's palsy, and physiotherapy was started. Upon re-examination, he did not move his right arm, his shoulder was slightly swollen, he was afebrile, and C-reactive protein was elevated. The initial radiographic finding was normal, but the ultrasound evaluation found evidence of proximal humerus osteomyelitis. Over the next two days, the condition did not improve despite the included therapy (vancomycin and amikacin). Then, joint drainage surgery was performed. The radiographic finding upon discharge showed significant destruction of the proximal humerus and shoulder joint. At the age of 12 months, the range of motion in the affected shoulder joint was less than in the left. **Conclusion** – Regular arm mobility in the early postpartum days, pseudoparalysis on examination, a swollen and raised shoulder, pain during passive movements, a positive ultrasound examination, and a high level of C-reactive protein are data that can reliably indicate the onset of osteomyelitis of the proximal humerus and help in the differential diagnosis between osteomyelitis and Erb's palsy. The lack of timely diagnosis of osteomyelitis and the delayed inclusion of therapy can lead to late consequences, such as significant destruction of the proximal humerus and the shoulder joint.

Key Words: Newborn ■ Proximal humerus osteomyelitis ■ Erb's palsy.

Introduction

Osteomyelitis and septic arthritis in neonates are relatively rare infections. The initial clinical signs and symptoms are discrete, so diagnosis is often difficult (1, 2). The global incidence of this disease is approximately 0.3 per 1000 live births, comprising 1–3 cases for every 1000 hospitalized neonates (1). The most common causative agent is *Staphylococcus* (70%), followed by *Salmonella*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, and *Escherichia coli*. The most commonly affected sites are the femur (29.4%) and humerus (23.5%) (3, 4).

The immature immune system in neonates and the lack of synovial basement membrane in the joints allow the infection to spread rapidly, which can lead to sepsis and, locally, to the destruction of the articular cartilage and ossification centers (1). Osteomyelitis and septic arthritis often present with pseudo-paralysis of the affected limb due to pain and discomfort caused by movement (5). When the proximal humerus and shoulder joint are affected, brachial plexus birth palsy (Erb's palsy) is often misdiagnosed. However, the existence of a concomitant neuropathy is a rare and insufficiently understood phenomenon, with few cases having been described (6). Delays in the diagnosis

and initiation of therapy can have devastating late consequences for the growing infant, such as joint destruction and growth failure (7, 1, 8).

The aim of this article is to raise awareness among neonatal caregivers regarding the early detection of osteomyelitis in order to start treatment quickly and avoid late consequences.

Case Report

We present a case of a 20-day-old male newborn who was examined in an emergency department due to decreased movement of his right arm. The lack of spontaneous movement of the right arm began 5 days before the examination. The newborn was diagnosed with Erb's palsy. After the diagnosis was made, outpatient physiotherapy was started. Due to painful crying upon handling the right arm and during the physiotherapy, the family reappeared for examination. In terms of his medical history, he had been delivered vaginally, and there was no report of a shoulder dystocia or an instrumented delivery.

Upon re-examination, the newborn cried painfully and did not move his right arm, and the shoulder was slightly swollen. He was afebrile and feeding normally, and he showed no overt signs of

systemic illness. However, on the first day of hospitalization, one febrile episode was registered, and he later presented with signs of sepsis.

Blood tests were performed, and the only abnormal finding was an elevated C-reactive protein (CRP) level (141 mg/L). The number of white blood cells (WBCs) was normal (18.8 10⁹/L). Blood samples were taken upon admission for blood culture, following which we started intravenous combined antibiotics (vancomycin and amikacin).

The initial radiographic finding was normal (Fig. 1A), but ultrasound evaluation of the shoulder joint found evidence of osteomyelitis (i.e., fluid collection adjacent to the affected bone). Magnetic resonance imaging (MRI) confirmed osteomyelitis of the right humerus with septic arthritis of the shoulder (Fig. 2A).

Medical treatment continued, with prolonged intravenous antibiotic therapy and supportive care. Over the next two days, the condition did not improve, despite the included therapy (swelling and redness of the joint increased). On the third day, joint drainage surgery was performed (Fig. 2B). He incompletely regained right arm movement three days after the surgery. *Staphylococcus aureus*, sensitive to the included antibiotics, was isolated in

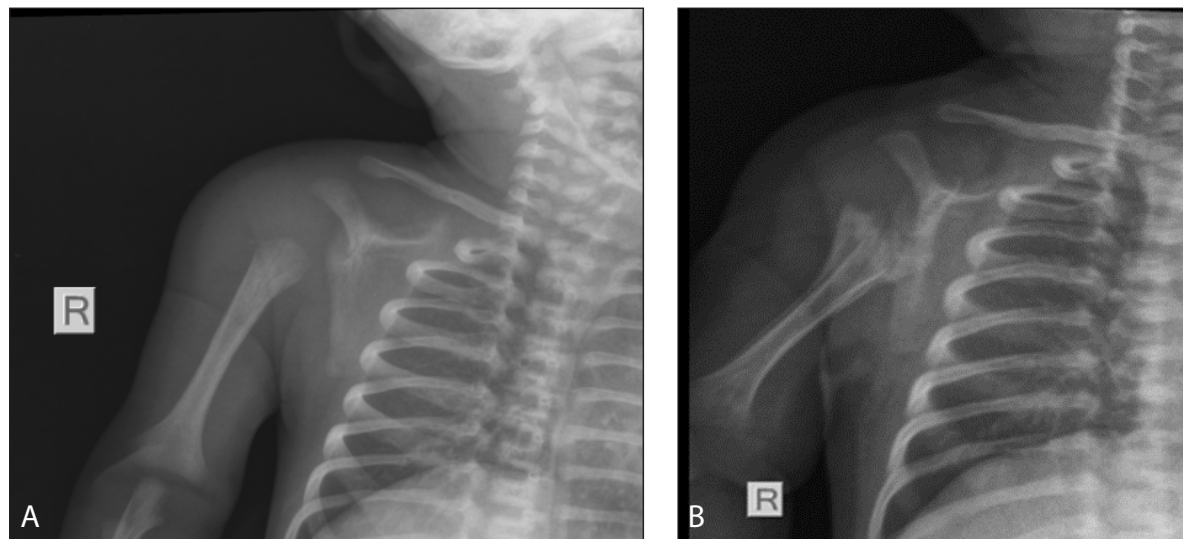


Fig. 1. A. Normal radiograph finding of the humerus right at hospital admission; B. Radiographic finding at hospital discharge showed significant destruction of the proximal humerus and the cartilage of the shoulder joint.

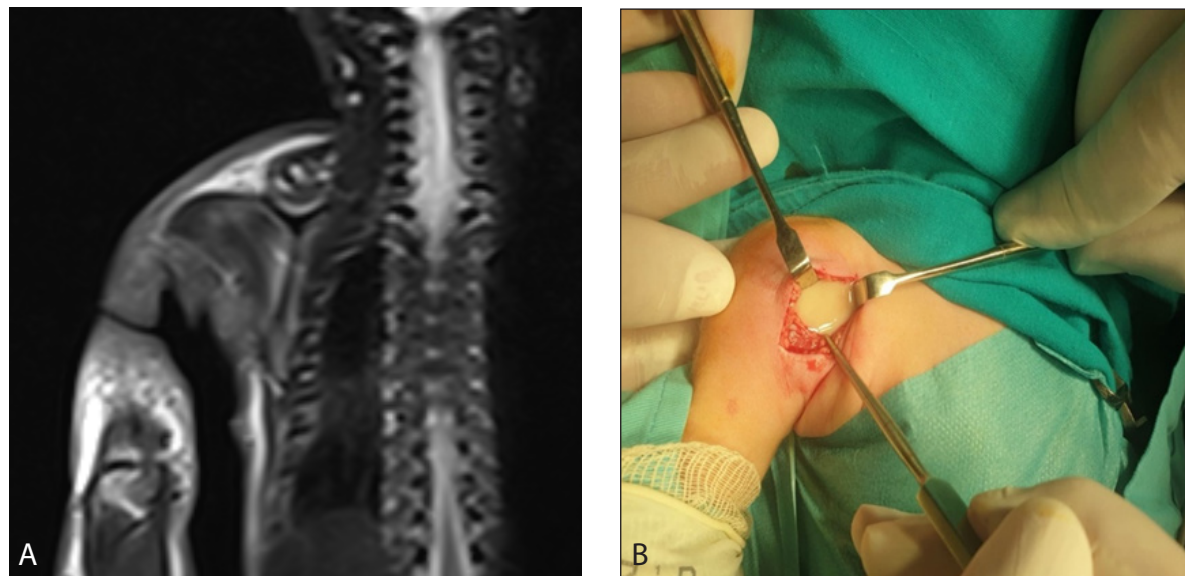


Fig. 2. A. MRI of the right shoulder and upper arm shows the inflammatory mass (hypersignal) of the joint with bone involvement. B. Proximal humerus osteomyelitis in the newborn - surgical findings (the inflammatory mass).

the blood culture and drainage content. Antibiotic therapy was continued after four weeks of intravenous therapy, with another two weeks of oral therapy. The radiographic finding of the right shoulder on discharge from the hospital showed significant destruction of the proximal humerus and the cartilage of the shoulder joint (Fig. 1B).

At the age of 12 months, after intensive physiotherapy, the range of motion in the affected shoulder joint was less than in the unaffected one, while the length of the arms was symmetric.

Now, at the age of 4 years, the right arm is shorter by 2.5 cm, the mobility of the arm is better than before, but the range of motion is less than on the other arm.

Discussion

Osteomyelitis in newborns is a serious disease, requiring early diagnosis and treatment to minimize the risk of late sequelae such as joint destruction and growth failure, with lifelong disability as a consequence (9, 10). The diagnosis of neonatal osteomyelitis is more difficult than in older children and is often delayed or misdiagnosed because

of the non-specific clinical presentation (subtle clinical signs and symptoms) and normal radiographic findings in the early period (11, 2).

In this case study, we present a newborn with unrecognized osteomyelitis at the first examination. The newborn was examined due to reduced mobility of the right arm (pseudo-paralysis). A diagnosis of Erb's palsy was made, and physiotherapy was recommended. After 5 days, due to painful crying during physiotherapy, the newborn was brought in for examination again. Other authors have also published cases of proximal humerus osteomyelitis, primarily recognized as Erb's palsy or joint dislocation (6, 7). Studies have also reported that most newborns present within a week after symptom onset (3). In a study involving 52 newborns diagnosed with septic arthritis, the average delay time was 14.9 days. Only 7 patients (13.5%) had a delay time less than 4 days. A 4-day delay has been suggested as acceptable in the treatment of uncomplicated osteomyelitis (3, 7, 12). In our patient, the delay time was 5 days, which could explain the more complicated clinical course and delayed consequences. The study of Bos CF and collaborators showed that in newborns (eight children - ten

shoulders), the delay between the onset of symptoms and diagnosis (1–7 days) led to shortening of the arm by 10 cm in one patient and in two patients to a disproportionately short humerus (13).

The elevated CRP also pointed toward an inflammatory process (7). Our patient had elevated CRP, while the white blood cell count was normal. However, in a case series from India, infants diagnosed with septic arthritis universally had leukocytosis, while, in a recent study, leukocytosis was reported only in 36% of children (1, 12). In our patient, there was no pathological radiographic finding at the beginning of the disease, which was consistent with the results of other studies (3). The authors believe that radiographic findings can be normal up to 14 days after the onset of symptoms; even after two weeks, only 20% of the cases show radiographic changes (12). Therefore, newborns whose radiographic findings are normal should be followed closely.

Ultrasound evaluation has also been shown, in our case, to be a useful diagnostic tool for quick orientation in the outpatient clinic. There are authors who believe that the use of ultrasound in the early stages of the disease can lead to a misdiagnosis of septic arthritis, if considered as a sole imaging investigation. MRI is the main investigation tool, having both high sensitivity (82–100%) and specificity (75–99%) (3, 12). MRI is more sensitive for the early diagnosis of osteomyelitis, complicated abscesses, and related soft tissue infections (14). In our case, an MRI was also crucial for confirming the diagnosis in hospital settings.

Due to the initial misdiagnosis, the inclusion of antibiotic therapy and supportive care for our patient was delayed. We consider that this was the reason for the complicated and prolonged clinical course, as well as for the need for surgical treatment and the late consequences. Studies also report humerus shortening of ≥ 3 cm as a consequence of septic shoulder arthritis in patients who did not undergo shoulder arthrotomy within ten days of disease onset (15). According to other authors, most patients sought treatment too late, when

significant damage to the bone and epiphysis had already occurred and even surgical drainage could not change the final outcomes (13, 16, 8).

The initial signs of osteomyelitis, according to other authors, include pseudo-paralysis, local swelling, redness, and/or excessive crying without fever (1, 10, 11). In our opinion, some anamnesis data, clinical signs, and tests certainly indicate the onset of proximal humeri osteomyelitis. Patients after the neonatal period have a better prognosis. A study involving 46 septic shoulders in 42 patients younger than 18 months at diagnosis followed for an average of 6 +/- 10 years showed that only 7% of the humeral heads were completely normal, but all patients were able to touch their mouth, and the back of the head with the hand on the affected side (17). In the period from 1960 to 1997, 168 cases of shoulder septic arthritis (adult and pediatric) were described in the English literature. A study describing five pediatric patients from that period concluded that a high index of suspicion and early evaluation of the affected shoulder by the clinician are required. With prompt antibiotic therapy and drainage of the shoulder, clinical improvement can be expected without serious long-term consequences (18).

Conclusions

Regular arm mobility in the early postpartum days, pseudoparalysis on examination, a swollen and raised shoulder, pain during passive movements, a positive ultrasound examination, and a high level of C-reactive protein are data that can reliably indicate the onset of osteomyelitis of the proximal humerus and help in the differential diagnosis between osteomyelitis and Erb's palsy. Osteomyelitis in newborns is a serious disease requiring early diagnosis and treatment to minimize the risk of late sequelae such as joint destruction and growth failure, with lifelong disability as a consequence.

Conflict of Interest: The authors declare that they have no conflict of interest.

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